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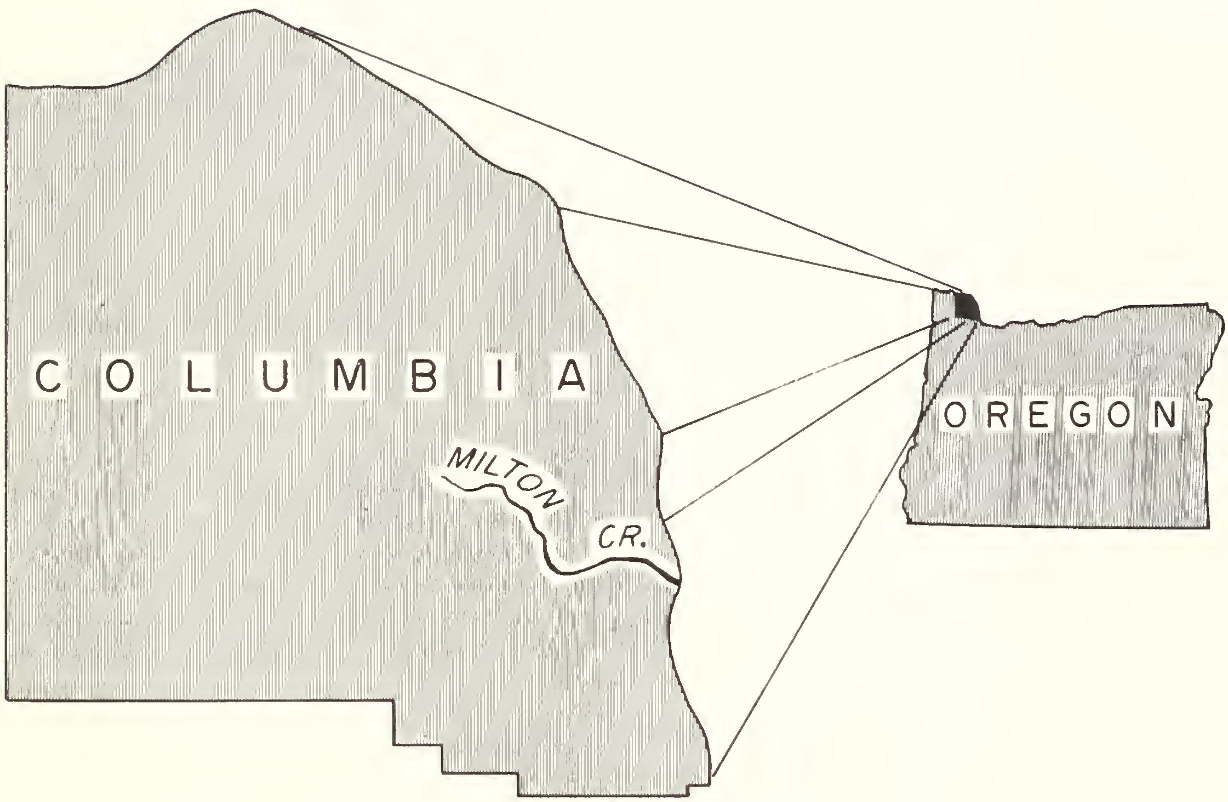
Portland,
Oregon

Floodplain Management Study

Milton Creek
Columbia County, Oregon

in Cooperation with Columbia Soil and Water Conservation District, Oregon Department of Water Resources, and Columbia County



FLOODPLAIN MANAGEMENT STUDY
MILTON CREEK
COLUMBIA COUNTY, OREGON

USDA-SOIL CONSERVATION SERVICE
PORTLAND, OREGON
in cooperation with
COLUMBIA SOIL AND WATER CONSERVATION DISTRICT
OREGON DEPARTMENT OF WATER RESOURCES
COLUMBIA COUNTY

JUNE 1984

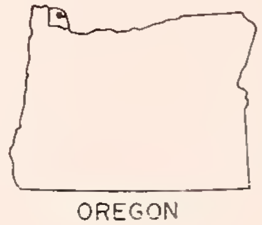
MILTON CREEK FLOODPLAIN MANAGEMENT STUDY

FOREWORD

The Milton Creek Floodplain Management Study is an analysis of the flooding conditions on the lower 7.8 miles of Milton Creek.

The hydrologic analysis was performed using historic precipitation, streamflow and flood information. Peak discharges, developed through hydrologic studies were used in the hydraulic analysis. The elevations of various frequency floods were determined. The information used in the different analyses are the conditions as they are in 1983.

The Milton Creek Floodplain Management Study was prepared by the Soil Conservation Service, U.S. Department of Agriculture, in cooperation with the State Water Resources Department, Columbia County, and Columbia Soil and Water Conservation District.



MILTON CREEK WATERSHED

COLUMBIA COUNTY, OREGON

1983

LEGEND

WATERSHED BOUNDARY

STUDY AREA AND LIMIT

SOURCE: Base map is from U.S.G.S. 15 minute quadrangle map.
Thematic detail prepared by the Oregon state staff.

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FLOODPLAIN MANAGEMENT STUDY
MILTON CREEK
COLUMBIA COUNTY, OREGON

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COLUMBIA COUNTY, OREGON

INTRODUCTION

STATE AND LOCAL NEEDS FOR STUDY

The City of St. Helens is along the Columbia River and at the mouth of Milton Creek. There are some flat areas in the lower part of the study area. St. Helens is approximately 30 miles north of Portland and 20 miles south of Rainier. Most all of the area at the lower end of Milton Creek is residential and commercial property. Approximately 3 miles of the lower study area is within the city limits of St. Helens.

A well-managed floodplain can reduce damage to property, reduce mental anguish and save lives by controlling the location of property and its susceptibility to flooding. Columbia County presently has a floodplain ordinance in effect. This study will give the data to more effectively implement the floodplain ordinance. This study, as it was developed, will meet the requirements of the Federal Emergency Management Agency (FEMA) for Floodplain Insurance Studies.

REQUESTING AND PARTICIPATING AGENCIES

The Columbia County government asked the Soil Conservation Service (SCS) to prepare a floodplain management study for Milton Creek. Columbia Soil and Water Conservation District (SWCD) and the State Water Resources Department (SWRD) endorsed this request. Work was begun after a Plan of Study (POS) was prepared and signed in July 1982. This study was performed in accordance with the Joint Coordination Agreement between the SCS and SWRD of April 1979.

STUDY AUTHORITIES

Floodplain Management Studies are carried out by the SCS as an outgrowth of the recommendation in a report by the Task Force on Federal Flood Control Policy, House Document No. 465 (89th Congress; ordered printed August 10, 1966), especially recommended 9(c), "Regulation of Land Use."

The authority for funding Floodplain Management Studies is Section 6 of Public Law 83-566, the Watershed Protection and Flood Prevention Act, which authorized USDA to cooperate with other federal and with state and local agencies to make investigations and surveys of the watersheds of rivers and other waterways as a basis for the development of coordinated programs.

In carrying out Floodplain Management Studies, SCS is also being responsive to Executive Order No. 11988, dated May 24, 1977. Section 2(c) of this Order states: "Each agency shall take floodplain management into account when formulating or evaluating any water and land use plans. . . ."

DESCRIPTION OF AREA

UPSTREAM DRAINAGE AREA

The Milton Creek Watershed is located in northwestern Oregon. It is part of the Willamette River subregion of the Pacific Northwest Region. Milton Creek is part of the accounting unit 17090012, as designated in the U.S. Geological Survey Hydrologic Unit Map. It drains into the Columbia River approximately 75 miles south of Astoria in Columbia County. Approximately 32 square miles are drained by the Milton Creek watershed which is 9 miles long and 4 miles wide. The highest point in the watershed is approximately elevation 1500 feet. Nearly all of the watershed is privately-owned land. Major tributaries to Milton Creek are Cox Creek, Perry Creek, Dart Creek and Salmon Creek. From its headwaters, Milton Creek flows generally north for about 5 miles then turns abruptly and flows southeast 11 miles to the Columbia River.

The hillside slopes within the watershed generally are 25% or greater while the stream slope runs between 1 and 5%. The portion of the stream studied has a slope of less than 1%.

The geologic formations of the watershed range in age from Oligocene sediments to recent alluvium. The Oligocene sediments are predominantly marine sandstone of the Gries Ranch and Pittsburg Bluff formations. These formations are overlain by the Columbia River Basalt of Miocene age. The Troutdale formation comprised of loosely indurated sandstone, conglomerate. Silt and interbedded volcanic breccia overlies the Columbia River Basalt. The Troutdale formation was laid down in the Pliocene epoch. Recent alluviums are found near the mouth of the watershed.

The most extensive formation in the watershed is the Columbia River Basalt. The main channel is primarily incised into and controlled by this formation.

Alstony and Bacona soils are the primary soils which occur on the upper part of the watershed area between Yankton and the watershed divide. They are deep, well-drained silt loam or gravelly loam, gently sloping to very-steep upland soils formed in colluvium from igneous or sedimentary rock. Permeability is moderate to moderately slow and the hazard of water erosion is moderate to very high.

The hydrologic soil group classification of the soils in Milton Creek is estimated as:

70% = Hydrologic Soil Group B
27% = Hydrologic Soil Group C
3% = Hydrologic Soil Group D

The climate of Milton Creek Watershed is of a marine type. The watershed is located on the west side of the Columbia River. Normal annual precipitation is approximately 55 inches with normal runoff of 30 inches. Sixty percent of the annual rainfall normally occurs during November through February. Only 10% of the precipitation occurs between June and September. Snow occurs at the higher elevations and has some effect upon flood flows in this drainage.

Most of the watershed area is in forest cover. Logging operations are scattered throughout the watershed. Homes and farmsteads are scattered throughout the watershed. Residential, commercial, and industrial development is concentrated in the lower portion of the watershed.

GEOMORPHOLOGY AND RELATED SOILS

Geomorphic surfaces have been mapped along Milton Creek from the Columbia River to the upper part of the watershed area. The area includes Ingram, Champoeg, Senecal, Bethel, Dolph, and Eola surfaces, plus the Looney unit.

The geomorphic surfaces fit a time sequence, but there are exceptions that are noted in discussion of individual surfaces. Each geomorphic surface is named for a locality where that particular surface is well expressed.

Ingram Surface. The Ingram surface includes the higher of two floodplains of Milton Creek. Topography typically consists of undulating conegations, with a maximum relief of 10 feet, produced by overbank channeling. The lower parts of this surface commonly flood, but higher bars seldom, if ever, do. Therefore, parts of the Ingram surface may be considered a low terrace. McBee, Sauvie and Wapato soils occur on the surface. Elevation is 10 to 300 feet in this area. The surface is 550 to 3,300 years in age.

Champoeg Surface. The Champoeg surface includes gravelly and rock floor terraces with a thin veneer of loamy sediments in places. It is probable that this surface has been affected by the Missoula Flood. Elevation is 100 to 170 feet in this area. Rockland-xerumbrept complex occurs on this surface. The surface is 11,000 years to late Pleistocene in age.

Senecal Surface. The Senecal surface is preserved as terrace remnants and is deeply incised below the former valley floor. Elevation is generally in the range of 170 to 350 feet. Quatama and Aloha soils occur on the surface. It is probably late Pleistocene in age.

Bethel Surface. The Bethel surface consists of subdued, rolling hills with moderate relief and gentle slopes generally graded to Senecal surface. Cornelius soils occur on this surface. It is late Pleistocene in age. Elevation ranges from 300 to 450 feet.

Dolph Surface. The Dolph surface is next to the oldest group of land forms in this area. Topography of Dolph varies, but is well above the general level of the valley floor. The Dolph occurs as remnants of extensive flats that have been dissected to form a rolling topography composed of a complex group of land forms that could be further divided into terraces, pediments, and upland remnants. Cornelius soils occur on this surface. Elevation ranges from 450 to 600 feet. It is probably middle Pleistocene in age.

Looney Unit. The Looney unit, as mapped, has no particular age connotation and, therefore, is not considered a geomorphic surface. The terrain of Looney unit is completely dissected and predominantly steeply sloping. Erosion is active on much of this unit with some areas of mass movement.

There are, however, occasional remnants of some of the oldest geomorphic surfaces in the area. The variability of age makes the Looney a useful unit for mapping acres of mountainous terrain. The Alstony and Dowde soils occur on this unit. Elevation is variable.

Eola Surface. The Eola surface consists of erosional remnants of the oldest stable surface in the area. Relief of the Eola is moderate with typical remnants having rounded hill and valley topography with as much as 150 feet of local relief within the unit. Hanging valleys are common. Slope gradients range from 2 to 20 percent and elevations generally exceed 600 feet. The Eola surface is considered middle Pleistocene. The Bacona soils occur on this surface.

These geomorphic surfaces are graphically indicated on Figure 1.

FLOODPLAIN STUDY AREA

Milton Creek floodplain management study covers in detail 7.8 miles of creek. The creek flows in a sinuous pattern, generally from west to east. The upper portion of this study area is mainly a narrow streambed with steep sides and the lower portion widens out somewhat to a flat floodplain area. The channel is 30 to 60 feet wide in most of the creek bed. It may widen out to 100 feet in some areas. The Columbia River effects the floodplain area for approximately one mile upstream from the mouth.

There are 9 road bridges and one railroad bridge crossing the creek within the study area. The bridges at Old Portland Road and Route 30 have an effect upon flooding.

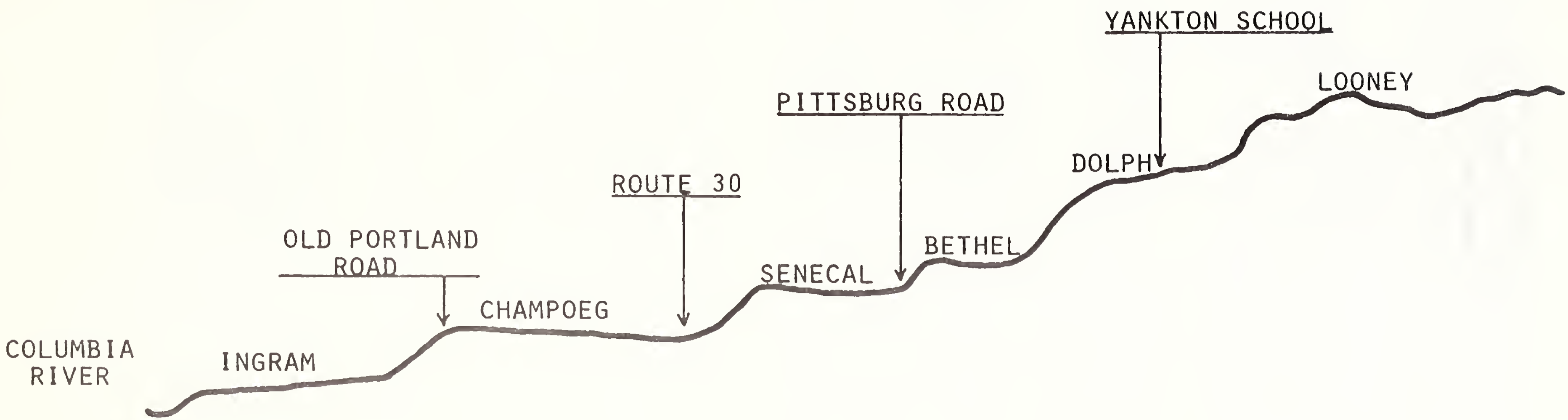
There are three major soils in the lower portion of the study area in the City of St. Helens. All three are being widely used for residential and commercial developments.

Sauvie silt loam borders Milton Creek where the stream flows into the Columbia River. Use limitations on this soil are severe for most all purposes due to flooding. Much of the City area is Rock outcrop-Xerumbrepts complex. This complex consists of very shallow soil over rock, or in some cases, exposed rock. Uses on this soil are limited mostly by the rock encountered. Aloha silt loam exists in much of the remaining area along Milton Creek, within St. Helens. The most common limitation on Aloha soil is wetness. Shallow excavation and dwellings with basements are rated with severe limitations. Dwellings without basements, small commercial buildings, local roads and streets, lawns, landscaping and golf fairways all have moderate limitations.

Upstream from Pittsburg Road, northwest of St. Helens, the soils vary considerably. The soil adjacent to the floodplain is Dowde silt loam, which has a severe rating for all building site development and sanitary facility uses due to slopes of 30% to 60%. Cornelius silt loam is found along much of Milton Creek from Pittsburg Road to the end of the study area at Brinn Road. Cornelius soil has a moderate-to-severe rating for building site development due to moderate shrink-swell and steep slopes. Mcbee silt loam is found on the floodplains near the bridge at the Pittsburg Road and Robinette Road junction. Mcbee soil is rated severe for all uses

FIGURE 1

GEOMORPHIC SURFACES - MILTON CREEK



involving building site development and sanitary facilities due to flooding and wetness. Cascade silt loam is found mostly on areas above Milton Creek from St. Helens to near Yankton. Limitations for building sites on Cascade soils range mostly from moderate to severe due to slope or wetness.

NATURAL AND BENEFICIAL FLOODPLAIN VALUES

There has been little change in natural and beneficial floodplain values in the lower two miles of the stream. The creek generally flows through native brush trees, except as it crosses Old Portland Road and at the outlet to Multnomah Channel where there is industrial development. However, much of this area is Port Commission land, which may be developed for industrial use.

Within the City of St. Helens, the creek flows through residential and commercial areas. Much of the floodplain is occupied with structures. Natural values are preserved in some portions of the creek border while most borders have been altered.

Natural and beneficial values in the floodplain upstream of St. Helens have been generally preserved. The area is in small farms and forests with little encroachment upon the creek. No cultural resources or historic sites are known to exist in the Milton Creek floodplain.

Restoration opportunities are minimal in St. Helens where the natural values have been altered. Very little pollutant is found in the stream. Floodplain soils and gravelly river bottom upstream of St. Helens filter them out and maintain high water quality. The creek is usually clean and clear.

Prime farmland soils which occur within the Milton Creek Watershed are Cascade, Cornelius, McBee, Quatama and Wapato silt loams, where slopes are less than 8 percent. These soil map units occur on bottomland terraces and foothills in the central part of the watershed including the upper part of the study area. This land should be preserved in farmland where the soils occur in economical size farm units.

Water is available for plant and animals throughout the year. There are limited opportunities for Milton Creek for fishing, hunting, sightseeing, and animal viewing.

Forest vegetation includes Douglas fir, Port Orford cedar, white oak, Oregon ash, vine maple, hazel nut and alder. There are many grassy areas along the creek.

There are anadromous fish runs and spawning in Milton Creek. Coho salmon and steelhead trout spawn in the upper areas of the creek. Chum salmon also spawn in Milton Creek, although the runs are sporadic. Rainbow trout have been stocked in the creek. Minimum flow rates have been set for Milton Creek, Cox Creek and Salmon Creek to maintain fishery values. Low flow in the summer and fall is a limiting factor to the fish runs at these times.

Wildlife in the watershed includes blacktail deer, Roosevelt elk, raccoon, skunk, beaver, mink, bobcat, fox, and oppossum. There are many kinds of rodents and squirrels along with hawk, pheasant, grouse, owl, quail, woodpecker, jay and many small birds. Endangered species in the area are the bald eagle and Columbia white tail deer.

There is little harvesting of timber from the floodplain because little commercial timber is available. Extensive timber harvest occurs in the uplands and headwaters of the creek.

FLOOD HISTORY

PAST FLOODS

The rainy season for northwest Oregon is between November and March. Seventy percent of the annual precipitation occurs during this period. Precipitation is heaviest in the months of December and January. During this rainy season, the ground is often saturated so that runoff is greater than that associated with the storms when the ground is dry.

Milton Creek frequently overflows portions of its banks for short durations. The 10-year storm will flood the channel (about 55 acres) and approximately 75 acres of land. Damage associated with these floods is not great. The runoff rate for the watershed is relatively fast, so peak discharges can occur suddenly following high rains.

Large floods of recent record in Milton Creek vicinity occurred in December 1964 and January 1974. Both of these floods were the result of a warm moist storm with heavy rain following a period of cold dry weather. Precipitation, and in some areas snowmelt and frozen ground, led to a very rapid runoff and widespread flooding. The December 1964 storm resulted in five-day precipitation of six inches in the Milton Creek area. Highest one-day rainfall was nearly two inches. Precipitation for the period January 13 through 16, 1974 was 4.85 inches at Portland and 6.84 in Forest Grove. Damage reports for these storms on Milton Creek are not available. Other historic floods in the area occurred in December 1861, January 1881, February 1890, January 1901, January 1923, December 1945, and December 1955.

PRESENT FLOODS

A large flood of 1% chance magnitude would cause significant flooding to about 110 acres bordering Milton Creek. A 1% chance flood is defined as a storm with a 1% probability of occurring in any year. The 1% chance flood is frequently referred to as a 100-year flood.

The 100-year storm event would result in channel velocities between 3 and 12 feet per second. Median channel velocity for this storm is 7 feet per second. Depth of flow varies between 5 and 14 feet with a median depth of 9 feet. An extreme (500-year) flood would inundate over 130 acres.

The narrow confined portions of the river can act as natural obstructions in the creek. These natural obstructions tend to collect debris and increase water levels within the reach. The bridges over the creek are man-made obstructions which also can cause an increase in flood elevation. Four of the bridges within the study area restrict the flow and cause increases in 100-year flood elevations. The four bridges are Old Portland Road (M-16B), U.S. 30 (M-26B), Pittsburg Road (M-38B), and a private drive off of Hanky Road (M-46B). The effect upon flood flows varies from a few inches to 3 feet. Bridges also can be debris collectors, resulting in added water heights. The effect of debris and debris dams upon maximum flood elevations has not been addressed in this study. The potential for debris buildup should be considered when determining location for and elevation of new construction.

There are 50 buildings within the 100-year flooded area. Thirty of the buildings are residences, while ten are commercial establishments. The remaining ten are garages, barns, or storage buildings. Flood depth varies from water around the foundation up to over one foot of depth in the building. No estimates of potential flood damage have been made.

Flood levels on the lower 3/4-mile of Milton Creek are dependent upon the flood elevations of the Columbia River and Multnomah Slough. High elevations on the Columbia River would raise the flood levels on Milton Creek. It is unlikely that both Milton Creek and Columbia River would experience high flows at the same time. However, should this occur, most of the area affected is in the brush and forest and would not be subject to much dollar damage.

FUTURE FLOODS

Future flooding conditions are expected to be similar to the present. The upstream land use will continue to be essentially forest practices.

Although logging is being carried out in extensive areas, the reseeding of forest areas will quickly return it to a forested hydrologic condition. Peak discharges are not expected to change in the future. Development and restrictions of the channel in the lower reaches of the watershed could have measurable effect on the elevation of floodwaters. Continued implementation of management controls on development will minimize future flood damages.

EXISTING FLOODPLAIN MANAGEMENT PROGRAMS

Columbia County Planning and St. Helens City Planning Building ordinance is designed to reduce damage caused by a 100-year flood. The ordinance states that all new structures meet the following requirements:

1. All structures be built one foot above floodplain level or so built to be watertight and waterproof within the floodplain.

2. All water supply systems be put in to minimize the infiltration of floodwaters.

3. All sanitary sewage systems are to minimize both the infiltration of floodwaters into the systems and also the sewage from leaving the systems and entering the floodwaters. They are to be built at least 200 feet from a water source.

Columbia County is presently in the emergency flood insurance program as administered by the FEMA. In those counties participating in the FEMA program, owners and occupants of all buildings and mobile homes in all unincorporated areas of the county are eligible to obtain flood insurance coverage. It is recommended that buildings and mobile homes within or adjacent to the delineated flood hazard areas carry flood insurance on structures and contents.

There is no specific National Weather Service (NWS) flood warning and forecasting system available for Milton Creek. When the NWS determines that a large storm or rapidly-melting snow may create flooding conditions in northwest Oregon, flood bulletins are issued to the local radio stations. A flood forecasting and warning system is in operation for the Columbia River. This would serve industries and residences on Milton Creek within the influences of the Columbia River.

Throughout the development of this study, public participation and information has been solicited. Information on previous flooding, including high water marks, were obtained from local residents and county officials. Preliminary floodplain maps were presented to St. Helens City Council and Columbia County Planning Commission at publicly-announced meetings. They were also available for public review at the Planning Commission.

ALTERNATIVES FOR FLOODPLAIN MANAGEMENT

Proper management of the floodplain can minimize flood damage losses in most flood hazard areas. Several management alternatives are available that could be used by local governments and individual landowners to improve management of the Milton Creek floodplain. This section discusses those alternatives on a conceptual basis, and summarizes the potential for reducing flood damages in the Milton Creek flood hazard area.

EXISTING OPTIONS

Existing floodplain management options include enrollment in the emergency flood insurance program and individual efforts by a few landowners at building floodwalls and dikes to exclude floodwater from their property. Flood insurance, in itself, does not directly prevent flood losses, but by encouraging communities to adopt building codes and management regulations, may help avert future losses. However, in order to establish sound building codes and management regulations, the hydraulic characteristics of the flood hazard area should be known. These characteristics are normally not developed under the emergency program, making enforcement of emergency floodplain regulations difficult. However, enrollment in the emergency flood insurance program makes it possible for floodplain residents to be partially reimbursed for flood losses sustained. Present trends in floodplain use and development would maintain hay pasture and berry crops on most of the land with little added encroachment of residential and commercial development. Future development of industrial area doesn't look likely in the farmland areas, but if it was to occur, it would not significantly change streambank erosion or flooding in most areas of the study. Individual efforts at floodplain management in the Milton Creek flood hazard area are directed toward protecting individual homes. Unless highly intensified and enforced, these efforts have a low potential for reducing flood damages in this flood hazard area.

CRITICAL AREA TREATMENT

Critical area treatment consists of applying conservation land treatment practices to bare or poorly-vegetated areas to reduce runoff, erosion, and sedimentation of stream channels. Proper vegetation reduces runoff and erosion several ways. Rainfall penetrates open spaces around roots, being absorbed by the plants and stored in a humus layer formed by decaying organic material. Some of this absorbed rainfall is used to process soil nutrients into plant food and then transpired into the atmosphere, thus reducing runoff. Vegetation protects the soil from the impact of raindrops while the root system binds the soil together, reducing erosion and sediment.

Most of the Milton Creek drainage area is properly covered with trees and grass, with a small portion bare or partially vegetated. Critical areas consist primarily of overgrazed pastures and dirt roads (logging roads and jeep trails) located on steep hillsides.

Land treatment can help to control soil loss through erosion and improve the usefulness of the soil. Upland watershed areas which are logged need erosion control measures. Reforestation is practiced when an area is logged off, which helps stop soil loss into the streams. Most of the

uplands in Milton Creek watershed area are in forest cover. Areas in lower portion of watershed area are maintained in pasture and farmland. Most of the area has good erosion control.

With critical area treament applied, the average annual runoff would be reduced a small amount. It was concluded that critical area treatment, by itself, would have a low potential for reducing flood damages in the Milton Creek flood hazard area. However, critical area treatment would reduce erosion and sediment. This would reduce the buildup of sediment bars in the streams and have a beneficial effect on water quality.

PRESERVATION OF NATURAL VALUES

Opportunities for environmental corridors exist in Milton Creek floodplain between stations 10+00 (Multnomah Slough) and 105+00 (Melvin Avenue) and above St. Helens between station 161+00 and station 235+00 along Hanky Road.

Milton Creek has some anadromous fish usage, and habitat for fish life and spawning should be protected. Fish habitat is generally good. It can be maintained by protecting the streambanks from encroachment, maintaining shade cover and controlling bank erosion. This protection of bank and stream would maintain the high value of fish habitat now available. Wildlife habitat can be maintained and improved by the same streambank and riparian vegetation protection measures discussed for fish habitat. Wildlife values can be further maintained by keeping floodplain land in farm uses.

Other management opportunities to preserve natural values in the above-mentioned stream reaches would include restricting development in the floodplain through zoning ordinances, land-use regulations, purchase of land, or negotiation of preservation easements.

NONSTRUCTURAL MEASURES

Nonstructural measures are flood-protection techniques, normally applied to individual buildings, that differ from the conventional flood-protection methods such as dams, dikes, and channel work generally used to protect groups of buildings. Nonstructural measures include the following: (1) acquisition, (2) relocation, (3) floodproofing, (4) flood warning, and (5) flood insurance. Of the 50 buildings within the floodplain, ten are commercial establishments and thirty are residences, whose damage could be reduced by protection measures. Following is an assessment of the potential to protect these buildings, using nonstructural measures:

1. Acquisition. Acquisition would be recommended for properties in high-hazard zones. The high-hazard zone is the area nearest the creek where high-flood velocity and deep floodwater creates a serious danger to the lives of residents. Because of the risk to loss of life associated with these buildings, they should be purchased, removed from the floodplain, and the land used for other purposes. There are no buildings along Milton Creek in high-hazard zones. Acquisition may still be an alternative on a few properties. It has a low potential for implementation.

2. Relocation. Relocation is limited to 7 to 10 buildings that could be moved a short distance to flood-free areas. A limiting factor that restricts relocation in the Milton Creek area is an available nearby vacant lot. This measure would probably cause opposition from landowners since they would be inconvenienced during the move; however, its cost is relatively low. This measure would have an average potential for implementation because of its low cost.

3. Floodproofing. Floodproofing consists of elevating buildings above the 100-year frequency flood by jacking up the building and extending the height of the foundation and plumbing; sealing low openings and porous foundation walls; or intentionally flooding building basements to equalize hydrostatic pressures and prevent wall collapse.

   Most of the residential and some of the commercial buildings could be elevated above the 100-year frequency flood. These buildings are located in the low-hazard flood zone. The low-hazard zone is the area away from the creek where danger to loss of life is insignificant. Most would have to be elevated a height of one to one-and-a-half feet. This may be acceptable to most landowners if proper landscaping is accomplished. Most residents would have to leave their homes for a period of two to three weeks during construction activities. Although this may be generally acceptable, elderly persons probably would not regard leaving their homes very favorable. It is judged that elevating buildings would have an average potential for implementation.

   Sealing low openings could be used to protect two or three of the commercial buildings and may be applicable to some residences. Sealing would consist of placing flood shields over low openings and coating masonary walls with an impermeable material. This has an average implementation potential. Intentional flooding of basements is not a feasible solution in this watershed.

4. Flood Warning. A flood-warning system normally consists of National Weather Service weather monitoring, a recording gage to monitor runoff, a flood watch, flood warning, and evacuation plan. The limiting factor in a flood-warning system for the Milton Creek flood hazard area would probably be the warning time available.

   Warning time is a product of the hydrologic and hydraulic characteristics of the drainage area upstream from the flood hazard area. Maximum anticipated warning time is less than one hour, which may render a flood-warning system ineffective for protecting the Milton Creek flood hazard area. Because of the limited warning time, a flood-warning system for this area would have a low potential for reducing flood damages, but may provide time for local residents to reach safety in very hazardous situations.

5. Flood Insurance. Columbia County is participating in the flood insurance program; however, the preparation of insurance rates and floodplain management regulations has been delayed by the lack of detailed hydrologic and hydraulic data. Hydraulic data developed during this study should be sufficient for use in preparing insurance rates and management regulations for the flood insurance program.

Milton Creek has a highly-developed flood hazard area containing 50 buildings that would experience some degree of flooding from a 100-year frequency flood. Flood insurance could reimburse owners for flood damage losses they sustain, while associated managment regulations could guide future improvements to avoid developments that would be flood prone. It is anticipated that flood insurance, with a good educational program to acquaint local landowners with its advantages, would have a high potential for implementation.

STRUCTURAL MEASURES

Structural measures considered for providing flood protection along Milton Creek include: (1) dams, (2) channel work, (3) removal of channel restrictions, and (4) dikes or floodwalls.

1. Dams. Two potential dam sites have been identified in Milton Creek watershed. Site A is on Milton Creek, upstream of Yankton and Site B is on Cox Creek. These two dams could control runoff from over 17 square miles of watershed. This is approximately 54 percent of Milton Creek drainage area. Flood damages could be reduced considerably with the two dams leaving only minor flooding within St. Helens. Each of the sites would take several acres of farmland out of production and require relocation of two-lane paved highways. The anticipated high cost would give this option a low potential for implementation, even though it could be very effective.

2. Channel Work. Channel work normally consists of widening or deepening the existing stream, changing its alignment, or lining it with protective material. Features for fish and wildlife and visual resource mitigation are also included.

   Channel work could be effective in reducing flooding through the City of St. Helens between Melvin Avenue and Pittsburg Road. However, widening of the channel would be difficult due to encroachment in several areas. Most of this portion of channel flows on bedrock, therefore, deepening the channel would also be difficult and very expensive. Changes in the channel by either widening or deepening would effect the present aesthetics of the creek. Property owners would probably not favor this change. Channel work would have a low potential for implementation along Milton Creek.

3. Removal of Channel Restrictions. Flooding from Milton Creek is increased by man-made restrictions placed across the creek. Four bridges restrict the flow in Milton Creek. Two of these bridges, Pittsburg Road and a private road crossing, have only a moderate effect upon the 100-year flood stages and cause little damage. Old Portland Road and Columbia Highway Route 30 bridges constrict the flow and cause increase flooding from the 100-year flood. Enlargement of the opening of each bridge could reduce the flooding and damage considerably. Flow characteristics at Route 30 bridge could also be improved by increasing the entrance capacity.

   Preliminary analyses indicate much of the damage near these two bridges could be eliminated by channel excavation under the bridges. An increase in area of 40 to 60 percent may be needed. More detailed

analysis of each bridge is necessary to determine size needed and if the present bridge and footings would be adequate. If the enlargement could be safely done without replacing the bridges, this option would have a high potential for reducing flood levels in Milton Creek.

4. Dikes and/or Floodwalls. There is an average-to-high potential to use dikes and/or floodwalls to protect Milton Creek flood hazard areas. Some areas could gain a high level of protection by creating a relatively low dike along the Creek. Where properties are set back from the bank and a low dike would meet the needs, there would be a high potential for implementing flood reduction. Present concrete floodwalls could be replaced with higher walls to give better flood protection. Floodwalls could be built to protect other properties from flooding. Dikes, etc. would need to be planned in total; i.e., for the entire reach considered so that induced flooding can be accounted for. Floodwalls would be expensive and construction right-of-way difficult to obtain; therefore, they would have no more than average potential to be built.

COMBINATIONS

Combinations of various types of measures, both structural and non-structural, can normally provide a higher degree of flood protection at less cost, than most individual types of measures by themselves, especially in highly-developed floodplains similar to the Milton Creek flood hazard area. Careful intermixing of the most cost-effective and socially-acceptable individual measures can enhance the potential to provide a socially-acceptable level of protection.

It would appear that a combination consisting of (1) critical area treatment, (2) bridge enlargement, (3) diking, (4) floodproofing, and (5) flood insurance, would provide the most cost-effective and socially-feasible method of protecting the flood hazard area along Milton Creek. Critical area treatment, although having a low potential for reducing runoff, would reduce erosion and sediment from critically-eroding land and improve the hydrologic condition and visual aspects of the area.

Enlargement of the bridges would reduce the flooding within a large portion of the business and commerce area along Milton Creek. It would also lower the extent and depth of floodproofing needed and make this measure more reasonable and socially acceptable. Diking could reduce flood damage with a limited cost to properties in some areas where the bridge alterations would not provide full protection. Flood insurance should be made available to all landowners to reimburse them for flood losses sustained during very large floods. Insurance premiums may be lowered to reflect the protection provided by the other measures. Building codes and floodplain regulations should be enforced by the local area to encourage future developers and home builders planning to build on the floodplain, to do so in a manner that would minimize flood damages.

The following table summarizes the potential of using floodplain management options to reduce flood losses in the Milton Creek flood hazard area.

MILTON CREEK MANAGEMENT ALTERNATIVES

Management Alternatives	Potential for Use 1/
Critical Area Treatment	Low
Channel Restriction Removal	Average
Nonstructural Measures	
Acquisition	Low
Relocation	Average
Floodproofing	Average
Flood Warning	Low
Flood Insurance	High
Structural Measures	
Dams	Low
Channel Work	Low
Channel Restriction Removal	High
Dikes	High
Floodwalls	Average
Combination	Average

1/ The potential for use is rated as high, average, or low. A rating of high indicates a significant degree of flood hazard reduction and overall acceptance by the public. A rating of average indicates an important degree of flood hazard reduction and general public acceptance. A rating of low indicates an insignificant degree of flood hazard reduction and/or overall unacceptance by the public.

FLOOD HAZARD EXHIBITS

The Milton Creek Watershed Map in the front of this report, outlines the drainage area of the creek. It also shows the extent of the study area. A location map is also included on this sheet.

The Index Map, Appendix A, shows the study area and the generalized 100-year floodplain. The location of each of the six flood hazard maps is outlined in the index map.

Appendix B contains the Flood Hazard Maps. The photomaps (plan view) show the area inundated by the 100-year and 500-year floods. In the places where only the 100-year floodplain is indicated, the line represents both the 100-year and 500-year floodplains. This is because the two floodplains are so close together that only one line could be shown on the drawings. The location of each cross-section and the 100-year flood elevation at the section is also on the photomap. The flood elevations have been computed at each cross-section and the elevation between cross-sections has been interpolated. After computing the flood elevations, the outline of the floodplain was developed in the field.

It is possible that small local islands exist within the floodplain and are not shown on the photomaps. Some slight flooding may occur outside the designated floodplain due to concentrated local runoff from adjacent areas. To determine the flooding potential at a specific location, a field survey would be required using the computed or interpolated flood elevations.

Other Appendices include: Appendix C - Glossary of Terms, Appendix D - Bibliography.

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USDA-SCS-FORT WORTH, TEXAS 1984

LEGEND

100-YEAR FLOOD BOUNDARY

500-YEAR FLOOD BOUNDARY

℄ OF STREAMFLOW WITH STATIONING

CROSS SECTION WITH 100 YEAR FLOOD ELEV.

RM-2 BENCH MARK

PHOTOMAP BASE IS FROM U.S.D.A.-A.S.C.S. FLIGHT OF 5-3-80.
THEMATIC DETAIL PREPARED BY OREGON STATE STAFF.

SCALE 0 200 400 FEET
0 50 100 METERS
APPROXIMATE

MILTON CREEK

FLOODPLAIN MANAGEMENT STUDY AREA

COLUMBIA COUNTY, OREGON

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed ... Date	Approved by ...
Drawn ...	Title ...
Traced ...	Title ...
Checked ...	Sheet No. 1 of 6 — Drawing No. March 1984 4-R-38312

MILTON CREEK

FLOODPLAIN MANAGEMENT STUDY AREA

COLUMBIA COUNTY, OREGON

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Date	
Designed........	Approved by ....
Drawn........	Title........
Traced........	Title........
Checked........	Sheet No. 2 of 6 — Drawing No. March 1984 4-R-38512

LEGEND

PROPOSED FLOODWAY — 100-YEAR FLOOD BOUNDARY — 500-YEAR FLOOD BOUNDARY

℄ OF STREAMFLOW WITH STATIONING

CROSS SECTION WITH 100 YEAR FLOOD ELEV.

PHOTOMAP BASE IS FROM U.S.D.A-A S.C.S. FLIGHT OF 5-3-80.
THEMATIC DETAIL PREPARED BY OREGON STATE STAFF

RM-2 BENCH MARK

SCALE 0 200 400 FEET
0 50 100 METERS
APPROXIMATE

N

USDA SCS FORT WORTH TEXAS 1984


HANKY ROAD
MILTON CREEK
HENKINS DR.
PITTSBURG ROAD
SUNSET BLVD.
WAGNER AVE.
SHORE DRIVE
RM-5
McARTHUR
HALSEY STREET
NIMITZE ST.
ALLEN DALE DRIVE
WHITE RD.
HELENA ST.
LEE STREET
MICHAEL ROAD
COLUMBIA BLVD.
NORTH VERNONIA ST.
VERNONIA
MILTON CREEK
FLOODPLAIN MANAGEMENT STUDY AREA
COLUMBIA COUNTY, OREGON
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Date
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Sheet No 3 of 6
Drawing No.
March 1984 4-R-38512
LEGEND
PROPOSED FLOODWAY
100-YEAR FLOOD BOUNDARY
500-YEAR FLOOD BOUNDARY
℄ OF STREAMFLOW WITH STATIONING
CROSS SECTION WITH 100 YEAR FLOOD ELEV.
150.6
M-10
PHOTOMAP BASE IS FROM U.S.D.A.-A.S.C.S. FLIGHT OF 5-3-80.
THEMATIC DETAIL PREPARED BY OREGON STATE STAFF.
RM-2 BENCH MARK
SCALE
0 200 400 FEET
0 50 100 METERS
APPROXIMATE

LEGEND

100-YEAR FLOOD BOUNDARY

500-YEAR FLOOD BOUNDARY

℄ OF STREAMFLOW WITH STATIONING

CROSS SECTION WITH 100 YEAR FLOOD ELEV.

PHOTOMAP BASE IS FROM U.S.D.A.-A.S.C.S. FLIGHT OF 5-3-80.
THEMATIC DETAIL PREPARED BY OREGON STATE STAFF.

RM-2 BENCH MARK

SCALE 0 200 400 FEET
0 50 100 METERS
APPROXIMATE

N

MILTON CREEK

FLOODPLAIN MANAGEMENT STUDY AREA

COLUMBIA COUNTY, OREGON

U. S. DEPARTMENT OF AGRICULTURE
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LEGEND

100-YEAR FLOOD BOUNDARY

500-YEAR FLOOD BOUNDARY

℄ OF STREAMFLOW WITH STATIONING

CROSS SECTION WITH 100 YEAR FLOOD ELEV.

RM-2 BENCH MARK

PHOTOMAP BASE IS FROM U.S.D.A.-A.S.C.S. FLIGHT OF 5-3-80
THEMATIC DETAIL PREPARED BY OREGON STATE STAFF.

SCALE APPROXIMATE

MILTON CREEK

FLOODPLAIN MANAGEMENT STUDY AREA

COLUMBIA COUNTY, OREGON

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed	Date	Approved by
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Checked	Sheet No. 5 of 6	Drawing No. March 1984 4-R-38512


UPPER LIMITS OF STUDY
YANKTON
RM-8
BRINN RD.
PITTSBURG ROAD
WEST KAPPLER ROAD
MILTON GLEN DRIVE
OLD BUNKER HILL ROAD
MILTON CREEK
LEGEND
PROPOSED FLOODWAY
100-YEAR FLOOD BOUNDARY
500-YEAR FLOOD BOUNDARY
℄ OF STREAMFLOW WITH STATIONING
10+00
CROSS SECTION WITH 100 YEAR FLOOD ELEV.
150.6
M-10
PHOTOMAP BASE IS FROM U.S.D.A.-A.S.C.S. FLIGHT OF 5-3-80.
THEMATIC DETAIL PREPARED BY OREGON STATE STAFF.
RM-2 BENCH MARK
SCALE 0 200 400 FEET
0 50 100 METERS
APPROXIMATE
N
MILTON CREEK
FLOODPLAIN MANAGEMENT STUDY AREA
COLUMBIA COUNTY, OREGON
U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Date
Designed
Drawn
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Approved by
Title
Title
Sheet No 6 of 6
Drawing No
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GLOSSARY OF TERMS

Acquisition	Purchasing flood-prone properties for the specific purpose of reducing flood damage by changing land use.
Critical Area Treatment	The application of vegetative and mechanical practices used to reduce runoff and erosion. Practices normally consist of seeding, tree planting, grass waterways, diversions, gully stabilizations, etc.
Environmental Corridor	A strip of land, usually along one or both sides of a stream, which is set aside, regulated, or otherwise protected to preserve its environmental values.
Flood	An overflow or inundation that comes from a river or other body of water and causes or threatens damage.
Flood Crest	The maximum height of the water surface during a flood. This may or may not be the maximum discharge (cfs).
Flood Frequency	An expression of how often a hydrologic event of given size or magnitude should, on an average, be equaled or exceeded.
100-Year Flood	100-year flood is the size of flood which will be equaled or exceeded, on the average, of once in 100 years or a one-percent chance in any one year.
500-Year Flood	A flood which will be equaled or exceeded, on the average once in 500 years. It is included to indicate an extreme flood.
Flood Hazard	The risk to life or damage to property from overflows of the river or stream channel; flood flow in intermittent or normally dry streams, floods on tributary streams; floods caused by accumulated debris or ice in rivers; or other similar events.
Floodplain	The area adjoining a river, stream, watercourse, ocean, bay or lake, which has been inundated by a flood or can be reasonably expected to be inundated in the future.
Floodproofing	A combination of structural provisions, changes, or adjustments to properties and structures subject to flooding primarily for the reduction or elimination of flood damages to properties, water and sanitary facilities, structures, and contents of buildings in a flood hazard area.

Hydrologic Soil Group — Hydrologic Soil Groups are used to estimate the runoff amount from a rainfall. There are four soil groups: A, B, C, and D. The A group has the lowest runoff potential and the D group has the highest runoff potential.

Percent Chance Flood — See Flood Frequency.

Prime Farmland — Land best suited for producing food, feed, forage, and fiber, and also available for these uses. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods.

Relocation — Moving a building from a flood-prone area by physically placing it on a vehicle and transporting it from the floodplain.

Return Interval — An alternate term to express flood frequency.

Sea Level Datum (SLD) — The full title is the "Sea Level Datum of 1929 Through the Pacific Northwest Supplementary Adjustment of 1974." A standard adopted for measuring elevations, which is based upon the average height of the sea for all stages of the tide over a 19-year period.

Water Surface Profile — A graph showing the relationship of water surface elevation to location, the latter generally expressed as distance above mouth for a stream of water flowing in an open channel. It is generally drawn to show surface elevation for the crest of a specified flood, but may be prepared for conditions at a given time or stage.

Wetland — An area where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities present; generally includes swamps, marshes, bogs, shallow lakes, and similar areas.

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